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SOVIET MACHINE BUILDING

No. 8

SELECTED TRANSLATIONS

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Introduction

This is a serial publication containing selected translations of articles on the machine building industry in the Soviet Union. This report contains translations on subjects listed in the table of contents below.

Table of Contents

1. New Machines for the Chemical Industry

/This is a translation of an unsigned article in Khimicheskoye Mashinostroyeniye (Chemical Machine Building), No. 4, July-August 1959, pages 1-3; CSO: 2900-N/8 (1)./

...The designers, technologists and workers of the chemical machine building industry in the last few years have developed and completed with positive results the tests of the principal models of new designs of filtration equipment --FPAK-type automatic filter presses, diverse types of continuous-action centrifuges with a high separation factor such as NOGSh-type horizontal settling centrifuges with wormgear discharge, NVV-type centrifuges with vibrational discharge of sediment, and a number of other machines facilitating the labor of workers and making it possible to automate chemicotechnological processes. the collectives of the chemical machine building plants in the Khar'kovskiy, Penzenskiy and Kievskiy sovnarkhozes face the worthy task of mastering the mass production of these machines in 1959.

The target figures for the development of the national economy in the years 1959-1965 provide for increasing the output of synthetic rubber -- more than threefold. Such a pace of development of the plastics and synthetic rubber industries requires the devising of new equipment both for producing and for processing rubber batches and plastics. The "Bol'shevik" Plant of the Kievskiy Sovnarkhoz has recently constructed a number of new machines for processing rubber batches. Thus, e. g., the DRS-140 high-speed rubber mixer has been developed and built.

However, the State Committee on Chemistry under the Council of Ministers USSR and the Yaroslav Tire Plant have long been neglecting the tests of the first industrial specimens of this mixer, thereby delaying its mass production.

The "Bol'shevik" Plant has constructed a heavy-duty high-speed cord calender, but it cannot operate this machine, because the enterprises of the Khar'kovskiy and other sovnarkhozes have failed to deliver the necessary complementing accessories.

The inadmissibility of such an attitude toward the introduction of new technology is obvious, and the collectives of the enterprises should wage a resolute struggle to liquidate these shortcomings.

The principal tasks for the immediate future consist in the conversion of the majority of the operations of the processing of plastics, rubber, and paste-like substances from intermittent to continuous-action and also in the designing of machine equipment for processing new polymer materials.

This could be exemplified by the following types of machinery. The existing method of processing plastics on rollers with prior mixing in covered intermittent-action two-roller mixers displays a number of essential shortcomings.

The replacement of this equipment by wormgear machinery will make it possible to materialize the continuous-action process and to automate it completely. As developed by the NIIKhIMMASh /Scientific Research Institute of the Chemical Machine Building Industry/ the design of a continuous-action wormgear mixer for vinyl polychloride cable masticate, in tandem with a granulator, satisfies the new requirements. The mastering of this mixer has been entrusted to a plant of the Leningradskiy Sovnarkhoz. It is necessary that the collectives of that plant and of the NIIKhIMMASh devote due attention to this machine so that it may be constructed, tested, and mass-produced in the immediate future.

The mixing of solid powders with liquid or viscous products and the obtainment of the so-called semirigid masses are very common operations in the chemical industry; usually they are carried out in intermittent-action two-roller mixers, which involves the employment of manual labor and does not ensure a stable composition of the batches. As developed by the Ukrainian NIIKhIMMASh, the continuous-action double-wormgear mixers for catalytic, cathode and anode masses and for polymetal ores and the products of the paints and lacquers industry lack the shortcomings of the intermittent-action two-roller mixers. The mastering of the serial production of continuous-action double-wormgear mixers is one of the primary tasks of the "Tambovkhimmash" Plant.

The target figures of the Seven-Year Plan envisage a steep rise in the output of the synthetics based on petroleum and natural gases. It is necessary to expand considerably the capacities for the production of ethylene and propylene from the hydrocarbon gases obtained as a result of the pyrolysis of petroleum products, and also from the side-recovery gases of petroleum extraction and processing and from natural gases. It has been decided to build in new plants condensation type, gas separating facilities because these are more economical than the absorption type ones.

The currently produced gas separation equipment has a unit productivity that will not be profitable for the planned large volumes of output of synthetics envisaged for the Seven-Year Period. Machine builders regard it as a primary task to develop, construct, and deliver for use gas separating equipment with a high unit productivity. However, these activities are being hampered by the failure of the institutes of the State Committee on Chemistry under the Council of Ministers USSR (Giprogaztopprom and Giprokauchuk) /State Institute for the Design and Planning of the Gas Fuel Industry and State Institute for the Design and Planning of the Rubber Industry/ to carry out a technical-economic study for determining the optimal unit productivity of gas separating facilities and to provide the NIIKhIMMA of the State Committee on Automation and Machine Building unde the Council of Ministers USSR with the necessary data for calculating the proper dimensions of gas separating apparatus and machinery. No further delays are to be permitted while solving this problem. The Giprogaztopprom and Giprokauchuk should, finally, approach the solving of this problem in a businesslike manner /"po-inzhenernomu"/ and to provide machine builders with the necessary data.

An economically justified size class of chemical apparatuses is of great importance to raising labor productivity in the plants of the chemical machine building industry. At present we are manufacturing approximately 1,500 typesizes of diverse chemical apparatuses, and an economically justified reduction in that figure is one of the cardinal tasks of the workers of the chemical machine building industry and, primarily, of the NIIKhIMMASh. The introduction of newly developed type classifications of chemical equipment commensurate with the needs of the chemical industry will make it possible to expand considerably the volume of output of chemical equipment in the specialized enterprises of the chemical machine building industry.

The development of the chemical industry is oriented toward expanding substantially the masses of raw materials, intermediates and finished products, utilizing comprehensively the raw material resources, maintaining stability of modes and composition of intermediates in every stage of processing, converting intermittent-action processes to continuous-action ones, and automating totally entire shops and plants. At the same time, the existing types of chemical production are being expanded and their technological processes are being intensified. These developmental trends confront the workers of the chemical machine building industry with the task of developing large-size industrial equipment, and devising completely or partly automated machinery and equipment which operate reliably and are convenient to service, and in which a njmber of operations can be combined within a single assembly and

which are manufactured with lower material and labor expenditures.

It is necessary that the chemicotechnological institutes of the State Committee on Chemistry under the Council of Ministers hasten the issuance of coordinated and sufficiently complete assignments to machine builders. The Main Scientific Research Institute of the Chemical Machine Building Industry -- NIIKhIMMASh -- should participate actively in drafting these directives.

The specificity of the operating conditions of chemical equipment, which is characterized by the aggressiveness of the working medium, extremal operating temperatures, and a broad range of pressures -- from deep vacuum to 1,500-2,000 atmospheres -- poses new requirements for design materials and protective casings. Although over a thousand different grades of various stainless, heat-resistant and structural steels have already been mastered in our country, it is necessary to expand the production of high-strength, acid-resistant and two-ply steels, titanium, tantalum, alloys of tantalum with niobium, and other metallic materials, as well as to employ plastics and other nonmetallic materials as structural materials.

The activities ensjing from the decisions of the June Plenum of the CC CPSU should be oriented toward solving thr following problems.

1. Development and mastering of improved, automated designs of machinery and equipment for new types of chemical production and primarily for the production of new polymers. The designs of individual machines and apparatuses should ensure the possibility of incorporating them into over-all automated installations, shops, and plants.

2. Improvement of the operating indexes of the manufactured equipment, reduction in the unit outlays of materials and abandonment of the manufacture of obsolete designs of machinery and chemical equipment.

3. Enlargement of assemblies.

4. Conversion of intermittent processes to cintinuous ones.

5. Further improvement in working conditions in chemical enterprises.

6. Expansion of the work on standardization so as to draft the necessary classification of types and type-sizes of machinery and equipment, on the basis of the grouping of standardized units into subassemblies and assemblies.

7. Perfecting of the technology of production of chemical equipment, mastering of efficient technological methods of processing new metallic materials.

8. Broader introduction of high-strength and corrosion-resistant metals and alloys, and nonmetallic materials

as well, in chemical equipment design.

A major role in solving the stipulated tasks belongs to the State Committee on Automation and Machine Building under the Council of Ministers USSR.

Utilizing the wealth of experience accumulated by the chemical machine building and chemical industries, that Committee should determine the fundamental trends in the field of the mechanization and automation of production processes. This should be done on taking into account and utilizing the advantages of socialist production. In addition to the mechanization and automation of technological processes and individual plants it is necessary to draft on a nationwide scale plans for the execution of the over-all mechanization and automation of entire branches of industry.

The State Committee on Automation and Machine Building under the Council of Ministers USSR shall foster the development and planning of scientific-research and design-experimental activities in the organizations under its jurisdiction and, jointly with the sovnarkhozes, in the enterprises and organizations of the sovnarkhozes.

The Committee will, jointly with the sovnarkhozes, be engaged in introducing highly productive automated and mechanized processes and new machinery, instruments and means of automation as well....

2. Development of the Mechanization of Construction in 1960

/This is a translation of an unsigned article in Mekhanizatsiya Stroitel'stva (Mechanization of Construction), No. 12, December 1959, pages 1-3; CSO: 2900-N/8 (2)./

At the end of October the Supreme Soviet USSR ratified the Plan of the Development of the National Economy of the USSR and the USSR State Budget for 1960.

The Soviet people has attained signal successes in implementing the goals of the first year of the Seven-Year Plan. Production plans are being overfulfilled by all Union republics. The 1959 plan of industrial output will be overfulfilled by about four percent, and the increment in industrial output compared with 1958 will amount to 11-12 percent instead of the planned seven percent.

The State*s capital investments in 1959 will exceed last year*s level by approximately 25 billion rubles.

The tasks regarding the output of machinery and equipment for the mechanization of construction operations are being overfulfilled. In 1959 the following quantities of machines will be produced in excess of the plan: excavators -- 200 additional units; bulldozers -- 500 additional units; dismountable bulldozer equipment for tractors -- 2,000 additional complete sets; mixing-plastering assemblies -- 270 additional complete sets, and much other equipment -- motorized graders, shrub cutters, trench diggers, crushers, etc.

The successes achieved in fulfilling the 1959 plan and the additional reserves uncovered in the course of socialist labor competition have made it possible to establish for 1960 higher targets than those envisaged in the Seven-Year Plan.

In the first two years of the Seven-Year Plan the volume of industrial output will exceed by approximately 100 billion rubles the target figures ratified by the 21st CPSU Congress. In the second year of the Seven-Year Plan the following amounts will be produced in excess of the amounts stipulated by these target figures: nearly three million additional tons of steel, nearly two million additional tons of rolled products, and 1,700 additional excavators.

Thus, in 1960 the foundations will be laid for fulfilling the Seven-Year Plan ahead of schedule.

Major goals are set by the 1960 plan with regard to capital construction. The volume of capital investments in

the State Plan is specified at 255.5 billion rubles, which exceeds the capital investments in 1959 by 11 percent, in 1950 -- 2.8 times, and in the prewar year 1940 -- 5.7 times.

Approximately 16 billion rubles will be invested in the development of the construction and building materials industries alone. Such capital investments will make it possible within one year to expand, e. g., the cement output capacity by six million tons, which in itself is more than the country's total output of cement in 1940.

Housing and cultural-communal construction in 1960 is assigned over 64 billion rubles, or one-fourth of all capital investments in the national economy. Housing construction in 1959 will total 80 million m^2 of dwelling area, and in 1960 -- 101 million m^2. Thus the dwelling area to be built in these two years will be equal to the entire dwelling area of all cities and workers' settlements in pre-Revolutionary Russia.

The rapid pace of construction and installation operations envisaged for 1960 will be accompanied by improvements in the qualitative indexes of construction: a seven-percent increase in the labor productivity of construction workers and a 1.5-percent decrease in construction costs, compared with 1959; and a broad introduction of the industrial methods of the conduct of operations.

The solving of these problems requires further development of the mechanisms, and design and application of new high-efficiency means of construction engineering.

The output plan ratified for 1960 provides for a substantial rise in the output of machinery and equipment for the mechanization of construction operations. Over the year, builders will receive about four billion rubles worth of new machinery and equipment.

Particularly rapid will be the growth of the output of excavating machinery, the demand for which is rising from year to year.

The output of excavators in 1960 will increase nearly 30 percent, and it will surpass considerably the volume of their output in the United States of America.

The output of large excavators with scoops holding four and more cubic meters will increase by 13 percent, and that of excavators with scoops holding two cubic meters -- by 55 percent, and that of multiple-scoop excavators -- by 13 percent.

The output of dismountable bulldozer equipment for tractors, as well as the output of scrapers and heavy-

duty motorized graders, will increase by more than 30 percent over the year; the output of loaders of various types will increase by 10 percent over the same period. The output of high-efficiency vibration-type road rollers will double; drilling and drilling-crane machinery will increase by 26 percent; and mortar mixers -- by 17 percent.

A considerable amount of equipment will be received by enterprises of the construction and building materials industries: thousands of crushers, crushing-grading installations and sieve screens, nearly 150,000 tons of cement equipment and spare parts for the cement industry, dozens of complete sets of equipment for precast reinforced concrete plants.

In its consumption of reinforced concrete in construction the Soviet Union had already overtaken all other countries of the world by 1958. In 1960 the output of precast reinforced concrete in the USSR will amount to 28.8 million m^3 and will be 22 percent higher than in 1959; the productive capacities of large-panel housing construction plants will reach six million tons of square meters of dwelling area annually by the end of 1960.

The output of cement equipment over the year will increase by 25 percent; cone and roller crushers -- by 17 percent; crushing-mill rolls -- by 22 percent; vibration screens -- by 35 percent; and presses for the production of brick and roof tile -- by 17 percent.

In connection with the extensive scale of large-panel housing construction, the demand of co;nstruction for mineral-wool products necessary for heat insulating the panels of outer walls is growing by leaps and bounds.

Commensurately, the output of technological equipment for producing mineral-wool goods will nearly quadruple over the year.

A complete set of equipment will be readied for the 101th in the series of large-panel housing construction plants with capacities for the production of 25,000, 35,000, 70,000, 100,000, and 140,000 m^2 of dwelling area annually, thus increasing the aggregate production capacity of these plants to over four million m^2 of dwelling area.

In 1960 large-scale work will be conducted to fulfill the program adopted by the June Plenum of the CC CPSU for accelerating technological progress in all branches of the national economy, inclusive of the further development of the over-all mechanization of heavy and labor-consuming operations in construction.

The National Economic Plan includes as a component part the tasks concerning the development and introduction of new construction technology in objects of nationwide importance. Altogether, the National Economic Plan provides

for developing and introducing models of 39 new types of construction and road machines. Furthermore, the plans of the union republics themselves will envisage the designing of an additional 174 new types of construction and road machines and equipment for the building materials industry.

A major part of the new machines will serve to promote the mechanization of labor-consuming earthwork operations in construction.

These machines will include suspension and trailer equipment for heavy-duty 140-HP tractors; scrapers with capacities of 10-12 m^3, with forced discharge, and with hydraulic drive; dismountable clod grinders with hydraulic drive and rear suspension; uprooters; and all-purpose hydraulic-drive bulldozers. Other equipment to be designed for suspension on these 140-HP tractors will include attachments for installation of poles of electric transmission lines and the equipment of an all-purpose bulldozer-loader.

Builders will receive new types of excavator-cranes with buckets holding 0.4 m^3, lifting capacity of six tons, diesel drive, turbo-transformers, and pneumatic tires or caterpillar tread. Further, they will receive special-purpose excavators for underground operations, with a bucket holding 0.8-1.0 m^3 and with electric drive; high-productivity rotor type trenching machines for laying trunk cable; wheeled self-propelled scrapers hitched to a single-axle 300-HP tractor, on low-pressure tires; self-propelled elevating graders hitched to a 165-HP single-axle tractor; earthmoving self-propelled trolleys holding 18 m^3, to be drawn by the same tractor; new self-propelled suspension equipment for the "Belarus'" tractor -- a bulldozer, a snow cleaner, a snow loader, a scraper, a semi-suspension single-bucket loader and a fork grab; a new single-bucket excavator with a bucket holding 0.3-0.4 m^3, on normal and widened caterpillar tracks for land reclamation and irrigation work. New removable suspension equipment for earthwork and land-reclamation operations will be designed for the DT-55 tractor, for hitching to the tractor's rear: shrub puller, furrow maker, drain ditch digger, and leveler; a number of removable suspension attachments for fastening to the tractor rear is also being designed for the S-100B tractor. The first model of a two-axle 165-HP tractor will be constructed, and diverse new excavating and transporting machines for construction purposes will be designed on the basis of that new tractor. The first such machines will include a bulldozer for the tractor. The mechanization of preparatory construction operations with regard to the clearing of forested areas will be promoted by constructing models

of rolling-loading machines on the basis of the T-140 pneumatic-drive tractor, with a productivity of up to 125 cubic meters per shift. Work will be done on developing the design of vibration type loaders for the construction of bridge abutments by the caissonless method, and vibration hammers for sinking wooden and reinforced concrete piles.

New equipment is being designed for the loading, transporting and warehouse work with cement: portable silos type cement depots with capacity of 25 tons and motorized cement wagons with load capacity of 24 tons, for hitching to the YaAZ-219 pivoting-frame tractor with pneumatic discharge of cement.

New designs will be developed for motorized cranes with lifting capacity of four tons, with electric drive, mounted on a ZIL-164 automobile chassis; and for motorized diesel-electric cranes with lifting capacity of 12-15 tons, mounted on a YaAZ-219 automobile chassis.

A great number of complete sets of new equipment will be received by enterprises of the construction and building materials industries. Such sets will include equipment for a cement plant with the world's largest unique rotary kilns producing 1,800 tons of clinker daily; equipment for a cement plant consisting of 4x60 meter rotary kilns for the dry method of cement production; equipment for the combined method of clinker production with prior desiccation of slurry; equipment for the manufacture of reinforced concrete pressure pipes with diameter of 400-1,500 millimeters, with productivity of 10,000-20,000 m^3 annually; equipment for the manufacture of centrifuged poles of electric transmission rules, with productivity of 15,000-20,000 cubic meters annually; and equipment for prefabricating the asbestos and cement components of large-panel housing construction, with productivity of 500,000 m^2 of dwelling area annually....

3. Improving Crane Design

/This is a translation of an article written by N. G. Dombrovskiy in Mekhanizatsiya i Avtomatizatsiya Proizvodstva (Mechanization and Automation of Production), No. 12, December 1959, pages 38-41; CSO: 2900-N/8 (3)./

Our machine building industry concerned with the manufacture of cranes has achieved signal successes.

However, in order to implement the tasks stipulated by the 21st Party Congress, it is necessary to overcome the still existing lag in the output of cranes, especially construction cranes. Thus, 70 percent of all workers in loading and unloading operations, which are 68 percent mechanized, are occupied with manual processes.

Many design bureaus design cranes, and many plants manufacture them without a due consideration of the changing technological requirements. The production of cranes is dispersed over dozens of agencies and numerous plants: more than 30 different types of tower cranes are being manufactured by 40 plants. Tower cranes with high lifting capacities, for industrial construction, are beint custom-made.

Many of the manufactured crane types differ little from each other in their parameters, but designwise they are differently executed, and this complicates their repairs, supplying of spare parts, and training of servicing personnel.

The production of automobile cranes of mainly a single design (K-32 type) is being continually transferred from one plant to another, and, moreover, a major part of the cranes is also produced in many, dispersed plants.

The serial production of pneumatic-wheel cranes for the conduct of installation operations has not been set up at all, while the caterpillar cranes currently used in these operations do not satisfy the related requirements; in a majority of cases these cranes are constituted by converted or even radically modified excavators. In an overwhelming majority of cases the characteristics of these cranes are unsatisfactory, especially for installation operations.

The basic construction crane pool at present consists of tower and automobile cranes, the latter being mainly ob-

solete three-ton cranes. As for the other crane types, they are represented in relatively insignificant numbers.

The railroad crane pool consists basically of obsolete machines, inasmuch as out of the 10,800 machines only one-half was built during the 1946-1958 period.

The serial production of pneumatic-wheel cranes is developing satisfactorily from the quantitative standpoint; however, a major part of their pool consists of machines with features unsuitable for the operations they should perform -- especially the installation operations, and it definitely does not satisfy the requirements as to variety and kind of types.

The maximum-heavy-duty types of caterpillar and wheeled cranes are manufactured in very small numbers, and, moreover, their power ratings are greatly inferior to those of the foreign cranes. An exception is constituted by tower cranes only.

We are not producing any heavy-duty caterpillar cranes with lifting capacity of 75-120 tons and with 50-60 meter jibs; as for the pneumatic-wheel cranes with lifting capacities of 50 tons and 25 tons, respectively, these we are producing in isolated cases.

Similarly, we are not producing any extra-small crane types for the mechanization of small-scale operations. This has resulted because our tractor plants are not producing the 5-12 HP tractors, which could serve as the basis for the extra-small crane types.

The tower crane pool consists to a major extent of machines of insufficient lifting capacity and, moreover, of extremely variegated types. Themajority of the tower crane types which we have hitherto been producing is characterized by: considerable weight, often exceeding the weight of advanced models with the same features by 15-25 percent; imperfections of the design scheme and poor quality of execution; low operating speeds and faulty speed reulation, which reduces productivity, deteriorates the quality of operations and complicates work; complicated assembling and dismantling; unadaptability for mass production because of the absence of specialization of production and because of the very limited standardization of units and parts, and unesthetic appearance.

An overwhelming majority of crane types manufactured by our plants compares as follows with the best progressive up-to-date /foreign/ models (see Table): weight under load -- 20 to 30 percent too high; dimensions -- 6 to 15 percent too large; jib lengths -- 25 to 30 percent too short; operating speeds -- 15 to 30 percent lower; pressure on

Index	Caterpillar Cranes		Pneumo-Wheeled Cranes	
	0	3	0	3
Maximum Lifting Capacity, in tons	5.0-50	1.5-120	3-25	1.5-68
Maximum Jib Length, in meters	7.5-45	6-60	7.5-25	6-60
Weight per ton-meter of Lifting Capacity, in tons	0.6-0.4	0.45-0.25	0.7-0.37	0.5-0.3

0 -- Soviet-produced cranes
3 -- Foreign cranes

Railroad Cranes		Tower Cranes		Transloading Cranes	
0	3	0	3	0	3
5-100	5-150	1.0-40	0.4-5.85	1.5-5.0	0.15-20
--	--	10-36	12-40	3-15	1.5-25
--	--	1.35-0.74	0.9-9.6	0.7-0.45	0.5-0.36

soil -- 20 to 25 percent higher. Further, compared with the best models, these cranes lack automation of remote control and their control gear design is not efficient enough.

As a rule, at present, the organization and technology of construction operations are planned to harmonize with the characteristics of the existing construction and installation cranes. In this connection, the weight and shape of the structural components to be installed are limited by the lifting capacity and maneuverability of the cranes.

The further development of construction cranes should be adapted to the types and parameters of structural components, methods of organization of conduct of construction and installation operations, and developmental prospects for these structural components and methods.

The fundamental trend in the development of structural design at present is the transition to the assembling of large structural components delivered in finished forms to the construction site or assembled on the construction site directly prior to their installation and erection. Hitherto, however, machine builders have not yet been provided by construction men with scientifically well-founded data on the optimal weights and shapes of structural components; the parameters on which the development of crane equipment is based have not yet been made more precise. For their part, construction men would like to receive from the machine building industry data on the forthcoming development of crane equipment.

The program of crane production should be drafted in accordance with the envisaged volume and varieties of construction, prospects for the development of designs and type-sizes of structural components, and the commensurate geographical distribution by the sovnarkhoz rayons. This has not been done previously. Of special importance to the design of new cranes is the problem of scientific research in this field.

Despite the extraordinarily difficult situation in regard to the development of new cranes that would satisfy current construction needs, the research institutes expect to complete their work on the related topics during 1961 to 1965. Consequently, the mastering of new crane designs will begin as late as in 1968-1970, a circumstance which is definitely unacceptable.

The scientific research work on crane construction is dispersed among several machine building scientific research institutes, and it does not ensure the satisfaction of the needs of public and industrial construction. As a result, many new crane designs face a long wait before

being introduced industrially.

Thus, e. g., although the MBTK-80 crane began to be mastered in 1954 it still has not been definitively treated; and since its industrial manufacture has already commenced, many of its shortcomings have to be eliminated while it is in operation. The Institute of Hoisting-Transporting Engineering GDR /German Democratic Republic/, whose representatives had observed this crane in operation several years ago, had in the meantime designed and mass-produced the Rapid-3 Crane in which the principal shortcomings of the MBTK-80 crane have been eliminated.

The T-223 tower crane manufactured by the Dnepropetrovsk Plant has already, in only four years, undergone numerous breakdowns. During the construction of the /sports/ stadium in Luzhinki, the M5-5 crane of the Moscow Tower Crane Plant, which had just been manufactured by that plant and approved for serial production, sustained numerous breakdowns of its winches and other subassemblies.

The modernized automobile crane (based on the YaAZ truck /chassis/) cannot be used at its maximum lifting capacity of 10 tons, because it tips over when under a load of seven or eight tons.

Our industry can manufacture high-quality ropes; nonetheless, the ropes used for cranes have, diameter for diameter, smaller tensile strength than the best Soviet and foreign ropes. This leads to increasing the diameter of winches and sizes of mechanisms, and for this reason alone the crane weight is increased one and one-half to two percent.

Construction cranes lack special electric equipment and apparatuses, and the installation of standard apparatuses and general-purpose electric motors in these cranes leads to increasing the dimensions of their mechanisms by 30 to 40 percent; it also augments the weight of electric equipment and reduces its reliability.

A great number of the required crane types cannot be designed because of the absence of base diesels displaying sufficient and appropriate reliability and longevity and rated at from five to 12 and from 150 to 500 HP.

The best modern caterpillar cranes have units and parts of alloyed steels. The use of dural jibs, which are approximately 40 percent lighter in weight than steel ones, makes it possible to produce cranes of a given weight with a 20-percent higher lifting capacity or cranes of a given lifting capacity with a lower weight. An American firm which had constructed a 41-meter jib of dural for a crane with a 35-ton lifting capacity had thereby reduced the weight of the crane by 20 tons, a fact which made it possible

to reduce the weight of the counter-balance by 60 tons, and thus to reduce the over-all weight of the crane by 37 percent. The organizational reasons for the present situation in the field of construction cranes are as follows:

1. Absence of a d efinite technical policy regarding the mastering of new machines, and partial survival of administrative barriers: as a result, the parameters of the new machines to be mastered are sometimes selected at random, which leads to excessive outlays and unnecessary diversity of crane types. This alone may explain why a part of the crane types widely used in the construction industry has not been considered in the materials of the VNIIstroydormash [All-Union Scientific Research Institute of Road Construction Machinery], which exercises the functions of the leading institute in the field. This pertains in particular to the planning of the production of gantry, overhead, and dragline cranes.

2. Intermittent planning and excessively remote deadlines for the mastering of new machines. The crane-manufacturing plants usually begin to design a new crane model a few years after the preceding model has been released for serial production. Thus, the design bureaus of the plants lack ready-made and detailed designs. Combined with the lengthy mastering periods, this leads to obsolescence of the machine by the time it is approved for serial production.

3. Crane modernization thus lags behind in time; quite often, "modernization" is simply a tag that is used when eliminating the shortcomings revealed during tests.

4. A completely unsatisfactory situation exists in the field of the manufacture, by allied branches of industry, of accessory equipment -- diesels, electric motors, apparatuses, ropes, friction materials.

5. Failure to use alloyed and lightweight steels, upon their proper thermal treatment, in cranes.

6. Unsatisfactory situation in the field of testing new equipment. As a result of the obsolescence of the standards for boiler inspection, short duration of test periods, and nonutilization of up-to-date testing machines, it is impossible to establish the reliability and service life of designs. Hence, imperfect designs leading to breakdowns and requiring considerable additional modifications and expenditures are often transmitted for production.

Such is the present situation in the crane industry. A large number of measures should be taken to improve this situation.

The present-day cranes used in public and private

construction were basically designed at a time when buildings were erected of small components.

Upon the transition to prefabricated construction, these cranes have proved to be only slightly suitable for the hoisting and precise installation of large prefabs; therefore radical changes in crane design are necessary.

The existing construction-installation cranes employ free suspension of a load on a rope, a fact which makes it possible to rotate the load freely and to shift it onto its side during its installation. In most crane designs, the height of the lifting of a load can be altered only through suspension or through raising or lowering the jib. Obviously, greater efficiency could be assured by using cranes of structural metal possessing a more rigid coupling of the grabbing organ; it is possible that the use of volume hydraulic drive may prove to be more expedient for carrying out the operating movements.

It is necessary to design a reliable, automatic grabbing device with forced release and remote control, so that the cranes could operate without tackle gear.

All design versions of cranes should provide for transporting and stationary speeds and for the regulation of stationary speeds within broad limits, so as to ensure the necessary precision and smoothness of installation operations. All these conditions require a maximal curtailing of clearances and gaps in the kinematic chain of mechanisms, including the clearances in gear transmissions.

The drives of installation cranes should ensure automatic damping of the oscillations arising as a result of dynamic loads.

To ensure a proper observation of the site of installation of structural elements, it is necessary to employ television equipment with one picture tube suspended on the end of the boom or in the load trolley, and the other picture tube mounted in the operator's cab; it is also necessary to employ two-way radio communication between cab operators and the dispatcher. The related research is being conducted by the Institute of Automation and Telemechanics Academy of Sciences USSR, as well as by the Plant imeni Kirov in Leningrad; nevertheless, it should be accelerated.

In connection with the trend for the transition to a further enlargment in the size of prefabricated structural components, it is necessary to consider the possibility of transition to the lifting and installation of entire room units. This will facilitate the solving of crane designs, because the installation of such units is simpler than that of separate flat structural components. The weight of such

units may reach 40 tons, which is fully permissible on using a 20-ton gantry crane with two suspensions.

Inasmuch as the modern prefabricated buildings are built with increasing frequency according to standard designs involving a limited number of components, therefore there exist the necessary conditions for automating crane operations -- and hence also the installation processes.

The development of crane designs should be tied to the establishment of tolerances for the prefabrication of structural components. To ensure convenience of assembling, clearances should be not less than 10 and not more than 20 millimeters.

An important requirement is prolonging the service life of cranes, which is tantamount to reducing metal consumption as a result of the possibility of reducing the output of cranes.

The NIIMosstroy [Scientific Research Institute of the Moscow Construction Administration] has, jointly with the design bureau of the Karacharovskiy Machine Plant of the Glavmosstroy [Main Moscow Construction Administration], developed a rough design of a special crane for assembling prefabricated buildings. This revealed the need to design two types of cranes: a jib-crane for installation of foundations, and a gantry for installation of that part of buildings which is above-ground.

The gantry crane ensures greater precision than a tower crane with a rigid coupling of the grabbing organ.

To develop an automatically guided rigid grabbing organ, it is necessary to provide for the possibility of slewing the grabbing element in three planes.

It should be noted that the use of hydraulic transmission will be conducive to reducing the oscillation amplitude and to a smooth shifting of speeds.

The transition of cranes to automation could be commenced by the automation of several separate operations, to be followed -- when the over-all mechanization of all the processes of erecting a prefabricated building is solved -- by the total automation of the guidance of all crane operations.

In addition to the foregoing, it is necessary to carry out circumstantial researches to determine the limits of the economic expediency of using various types of cranes, and the new machines to be mastered. Thus, the improvements in crane d esign should proceed along the following paths:

1. Designing cranes with a rigid, mobile grabbing organ and with removable attachments, for the complete mechanization and partial automation of the assembling of build-

ings and structures of prefabricated flat and linear elements using tackle gear.

2. Designing cranes for assembling buildings of prefabricated room units, with complete mechanization of the process of the hoisting, moving, and installation of the units.

3. Designing heavy-duty tracked cranes-excavators with lifting capacities of 60-100 tons and with a load moment of the order of 500 and 800 ton-meters, alloyed-steel and dural booms up to 50 and 70 meters long, and operating weight of not more than 140 and 220 tons, respectively.

4. For hydrotechnical construction -- improving the designs of the concrete-laying dragline cranes with drives ensuring the automatic damping of oscillations of the carrying organ and compensation of its sag when discharging the buckets.

5. Mod ernization of the existing crane designs and systematization of their types in accordance with results of the work on determining the limits of economic expediency of using various crane types.

4. Soviet Turbine Building and Export of Steam Turbines

/This is a translation of an article written by M. Sichikov in Vneshnyaya Torgovlya (Foreign Trade), No. 11, November 1959, pages 34-38; CSO: 2900-N/8 (4)./

...The combined capacity of the turbines manufactured by enterprises of the Soviet Union in 1958 amounted to 6.6 million kilowatts, whereas in the Russia of 1913 it had amounted to only 6,000 kilowatts.

At present the USSR possesses specialized, well-equipped plants and shops for the production of various types of turbines. Toward 1958 the combined capacity of high-pressure steam-turbine installations already accounted for over 60 percent of the over-all capacity of the country's heat and electric power stations.

...In addition to the designing of medium- and high-capacity high-pressure turbines in the last few years considerable progress has been achieved in the production of low-capacity (up to 6,000 kilowatts) turbines designed basically for the combined generation of electrical and thermal energy.

The design and technology of the production of these turbines reflect the latest feats of science and engineering. A number of interesting technical solutions have been applied in the field of hydrodynamic regulation, journal and thrust bearings, etc. While the foundationless portable turbogenerator units with an electricity-generating extraction of five-atmosphere steam produced in 1958 were designed for a capacity of 750 kilowatts, the rating of the units produced this year has been upped to 1,500 kilowatts. These turbo-assemblies, consisting of three units (turbine with generator on a common welded frame, condenser with pumps, and deaerator) constitute compact, small and highly economical installations. In 1959 several such assemblies are being built for the KNR /Chinese People's Republic/.

The turbine building industry of the USSR is at present producing steam turbines with variegated capacities -- from 750 to 200,000 kilowatts.

The Committee on Standards, Measures and Measurements under the Council of Ministers USSR has approved a new State Standard (GOST 3618-58) for stationary steam turbines for driving electric generators. The new stand-

ard, which became effective as of 1 January 1959, regulates stationary steam turbines -- with initial steam pressure ranging from 35 to 130 atmospheres -- for driving electric generators.

These turbines can be classified into two groups according to their energy characteristics: turbines for generating electrical energy and turbines for the combined generation of electrical and thermal energy. The new standard applies also to turbines for generating electrical energy with condensation of steam, without controllable extraction of steam, and with capacities of from 6,000 to 200,000 kilowatts. The technical characteristics of these turbines are cited below.

Technical Characteristics of Soviet Condensing Turbines With Heat-Generating Controllable Steam Extraction
(Nominal Pressure of Extraction: 1.2 Atmospheres)

Capacity (in megawatts)	Initial Parameters of Steam: Pressure (in atmospheres)	Initial Parameters of Steam: Temperatures (in Centigrade degrees)	Magnitude of Steam Extraction (in tons per Hour)
2.5	35	435	14
4	35	435	22
6	35	435	30
12	35	435	65
25	90	535	90

Technical Characteristics of Soviet Condensing Turbines With Electricity-Generating Controllable Steam Extraction
(Nominal Pressure of Extraction: 5 Atmospheres)

Capacity (in megawatts)	Initial Parameters of Steam: Pressure (in atmospheres)	Initial Parameters of Steam: Temperature (in Centigrade degrees)	Magnitude of Steam Extraction (in tons per hour)
0.75	35	435	5
1.5	35	435	10
2.5	35	435	18
4	35	435	25
6	35	435	40

Technical Characteristics of Soviet Condensing Turbines With Electricity- and Heat-Generating Controllable Steam Extraction

Capacity (in megawatts)	Initial Parameters: Pressure (in atmospheres)	Initial Parameters: Temperature (in Centrigrade degrees)	Magnitude of Steam Extraction (tons/hour), Pressure in Atmospheres: 1.2	7	10	13
12	35	435	40	-	50	-
12	90	535	25	30	-	-
12	90	535	25	-	35	-
25	90	535	50	-	70	-
50	90	535	100	-	-	14
50	130	565	80	120	-	-
50	130	565	90	-	-	11

At present, work is in progress on designing unique 300-megawatt /300,000-Kilowatt/ turbo-assemblies with initial steam pressures of 240 and 300 atmospheres and initial steam temperatures of, correspondingly, 580 and 650°C.

It is expected that the production of the 240-atmosphere, 580°C turbine units will be mastered 1960-1961.

The turbines for the combined generation of electrical and thermal energy are classified into four groups: the first three groups include condensing turbines with one or two controllable steam bleeder s for electricity- and heat-generating purposes, while the fourth group includes back-pressure turbines without condensing devices.

A great variety of turbines with controllable steam bleeders and with capacities of from 750 kilowatts to 50 megawatts is being manufactured in the USSR, and they are in great demand on the foreign market.

Other new turbines that are now in the d esigning and preparatory stage are 50- and 100-megawatt turbines with heat-generating steam extraction /bleeding-off/ and with initial steam parameters of 150 atmospheres and 565°C; there also is a 100-megawatt back-pressure turbine with supercritical steam parameters of 300 atmospheres and 650°C.

The new standard does not regulate the high-pressure turbines of the purely condensing type with controllable steam extraction, back pressure, initial steam parameters of 90 atmospheres and 500°C, and capacities of from six to

100 megawatts, which have already been mastered for production; nor does it regulate the back-pressure turbines with low initial steam parameters -- 150 atmospheres and 350°C, and others... The achievements of the Soviet turbine building industry and the rapid growth of turbine output enabled the Soviet Union as far back as in 1934 to commence exporting steam turbines, when five turbines rated at 1,500 and 2,500 kilowatts were delivered to Turkey, to textile combines in the cities of Kaysari and Nazilli. The Soviet steam turbines had by that date already displayed impressive operating qualities.

Soviet-produced steam turbines have acquitted themselves well abroad. Turbines with ratings of from 1.5 to 100 megawatts delivered by the Soviet Union to China, Poland, Rumania, Bulgaria, Hungary, and other countries, have won high esteem. Thus, the engineers and technicians at the heat and electric power station of a Bulgarian industrial plant -- after a Soviet turbine had been set into operation there -- turned to the director of the Soviet manufacturing plant with a request to transmit their appreciation to the collective of the Soviet plant which, as they write, "has designed an interesting and felicitous type of a simple, compact turbine." The Bulgarian comrades singled out the high qualities of the turbine, the operational reliability of its hydrodynamic regulation, and the smooth performance of the entire assembly.

The records of the reception of two Soviet turbines installed at the heat and electric power station of an industrial plant in Poland in May and in December 1958 note that the turbogenerators synchronize easily with the power network, that the regulating system operates stably during variations in the electrical load from idle to nominal, that the vibration does not exceed 0.01-0.03 mm, and that the turbines and all auxiliary equipment -- including the signaling system -- perform irreproachably and in absolute conformance with the requirements of technical standards.

In exporting turbines to the Socialist countries the Soviet Union fortifies and develops the power base of these countries, and thereby promotes a rapid upsurge in their economies. We need merely observe that at the beginning of 1959 the Soviet Union was providing assistance to the Socialist countries in the construction of 87 thermal and hydroelectric power stations with an aggregate installed capacity of over 15 million kilowatts. Towards 1959 the Socialist countries had opened a number of large electric power stations erected with our assistance, so that as a result the aggregate capacity of electric power stations in these coun-

tries had increased by more than four million kilowatts -- one million in the Chinese People's Republic alone. Deliveries of complete sets of thermal electric power generating equipment from the Soviet Union will assist Poland in solving successfully within a short period of time the problem of activating new electric power stations with an aggregate capacity of 2.5 million kilowatts.

At the beginning of 1959 the Soviet Union was providing technical assistance to economically underdeveloped countries in the construction of 12 thermal and hydroelectric power stations.

The high technological level of the steam turbine building industry in the USSR, rapid growth in turbine output during the years of the Seven-Year Period, expansion of the variety of that output, and increase in its economicality and operational reliability -- all these are creating exceptionally propitious conditions for a considerable expansion of the exports of steam turbines during 1959-1965.

The Soviet Union at present is one of the biggest exporters of steam turbines. The demand for Soviet turbines has risen appreciably. Our foreign trade organizations are receiving many orders for the delivery of steam turbines mainly from complete enterprises. Thus, in this year the export of steam turbines with generators by the USSR will be nearly thrice the 1958 level. The largest number of turbines of various types and capacities goes to the Chinese People's Republic.

Considerable demand abroad exists for Soviet turbines for the combined generation of thermal and electrical energy. Such turbines, of 50-megawatt capacity, will be delivered to Bulgaria, the Chinese People's Republic, the Korean People's-Democratic Republic, and Rumania. Orders for 25-megawatt turbines with two steam bleeders have been received from Albania, Bulgaria, the Democratic Republic of Vietnam, the Chinese People's Republic, the Mongolian People's Republic, Poland, Rumania, Afghanistan, India, Indonesia, the UAR, and other countries. Many customers have already received these turbines.

...In 1965, compared with 1958, the aggregate installed capacity of all electric power stations in the USSR will more than double, and that of turbine thermal electric power stations alone increased 2.4 times. Of the 58-60 milli kilowatt capacity of turbine electric power stations which wi be activated during the Seven-Year Plan, 47-50 million kilowatts will be represented by the thermal electric power stations -- mostly large ones with 100-, 150-, 200-, and 300-megawatt turbines.

To satisfy the demand of the country's national economy and to safeguard the rapid growth of exports, the annual output of turbines in our country in 1965 is expected to be approximately three times as high as in 1958...

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